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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/540,250

01/05/2006

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EXAMINER

HOBAN, MATTHEW E

ART UNIT

PAPER NUMBER

4116

MAIL DATE

DELIVERY MODE

01/23/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/540,250	Applicant(s) SHIRAKURA, SHIGEO	
	Examiner Matthew E. Hoban	Art Unit 4116	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>6/22/2005 & 10/28/2005</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Status

Claims 1-10 are pending and presented for examination.

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on 10/28/2005 was filed. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner. **However**, it appears that no 1449 form was submitted with this IDS. It is requested that a 1449 form be submitted for this IDS.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1-5 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Hervert et al in 3,785,781.

Hervert teaches a honeycomb catalyst, which is directed towards the catalytic conversion of exhaust (flue) gases, such as oxides of nitrogen, hydrocarbons and other undesirable byproducts of normal combustion in automobiles (See Column 1, Lines 36-60 and Column 2, Lines 8-14). Specifically, the catalyst contains

several zones, which are each catalytically active, where each zone has channels of different sizes. The reason for this arises from basic theories in chemical engineering, which deal with the fact that reaction rate in fluid based catalysts, are limited by the mass transfer rate of the fluid. Where, the flow of the fluid is lamellar, mass transfer is based almost only on diffusion (very low). This is due to a film that forms along the catalyst walls, inhibiting reaction between the bulk fluid and the catalytic centers. Hervert realizes this fact and defines the length of each portion of his catalyst based upon this property (See Column 5, Lines 8-54).

Hervert's catalyst includes both inlet and outlet means connected by a plurality of flow paths (honeycomb structure, see Column 2, Lines 34-53). The honeycomb structure is treated so that it becomes catalytically active, which means that any catalysis would occur on the sidewalls of the flow paths (See Column 4, Lines 53-70). It is not stated explicitly that the structure is used for NO_x catalysis, but the Summary of the Invention states that the "primary object of the present invention [is] to provide for the method and means for catalytically converting fluids such as exhaust gas." It was previously mentioned in the Background in paragraph two, that oxides of nitrogen are waste products in automobile exhaust flow. Therefore, the claimed invention would have been envisaged for one of ordinary skill in the art to use Hervert's invention as a NO_x catalyst, where this would only necessitate selecting a suitable catalyst, which is a task that is well

within one of ordinary skill in the art and is outlined in the paragraph bridging columns 4 and 5.

As was stated previously, the length of Hervert's catalyst is defined by several (Hervert uses three) catalytically active honeycombs with varying pore sizes. The length of each honeycomb is defined by the length that the fluid maintains turbulent flow, where Hervert defines turbulent flow as having "an initial square velocity profile". When the velocity profile becomes parabolic and the boundary layer becomes stagnant, catalytic activity decreases. At this point, a second honeycomb structure with a different pore structure is used to reestablish turbulent flow. This process is repeated one more time, making a total of three different honeycomb structures with turbulent flow throughout. Although the length of each of these honeycombs is not defined by the equations as found in the instant claims and the explicit lengths found in claims 5 and 8, they are governed by the same theories and assumptions. Thus the honeycomb structures of both Hervert and the instant claims would be of essentially the same length, even though Hervert defines his length based on velocity profiles, and the instant claims define the length in terms of a formula. Based on the disclosure of Hevert, one of ordinary skill in the art would be able to form a catalyst of the length specified in Claims 5 and 8 of between 300 and 450 mm for an exhaust (flue) gas under the conditions delineated in claim 2 (6 m/s gas flow rate and 6mm aperture size). At the specified length in claims 5 and 8, the gas flow would

exhibit straightening or in the words of Hervert would assume a parabolic velocity profile (See Column 5, Lines 8-53).

Therefore, in view of the disclosure of Hervert, the application of his invention to a catalyst under specific gas flow rates and aperture sizes is well within the skill of one of ordinary skill in the art. The formulae used to define the length of the catalyst only serve as an equivalent way of defining the length of the catalyst as already defined by Hervert, where Hervert defined this natural phenomenon in terms of velocity profile. In light of this fact, it would therefore be inherent for a catalyst that meets the velocity profile of Hervert to also fall into the equations described in the instant claims. Furthermore, the use of several different catalyst stages (Hervert uses 3) in order to retain turbulent flow is directly anticipated by Hervert.

The method by which Hervert produces his catalyst is delineated in Column 5 Line 66 through Column 6 Line 28. The method comprises places three catalyst honeycombs into a reactor in a specific order and then wrapping the three pieces with a ceramic wrapping material.

6. Claims 6-10 rejected under 35 U.S.C. 103(a) as being unpatentable over Hervert et al in 3,785,781 as applied to claims 1-5 as shown above, and further in view of Pfefferle in 4,407,785

Hervert fails to teach the space in between catalyst layers for the intermingling of gases as stated in Claim 6.

However, Pfefferle teaches that in a multi-stage gas catalyst such as that of Hervert, it is advantageous to include spaces between the catalyst layers. Pfefferle's disclosure states that these air gaps positively affect the catalyst's efficiency. The spaces allow the gas to commingle with gas from other flow through paths. This means that if one path were to be catalytically deactivated, the gas from this path would mix with partially catalyzed gasses from a functioning path and then would be introduced into the next catalyst layer. Due to this configuration, the gas flow within the catalyst would maintain a constant turbulent state and would be more uniformly catalyzed (See Column 5). Pfefferle also realizes the advantage of maintaining turbulent flow in the catalyst. The reason for this deals with the rate of mass transfer and the fact that it increases when turbulent flow is maintained.

The combination of these two products would have been obvious to one of ordinary skill in the art and has clear motivation in that it allows a flue gas to be catalyzed more efficiently and homogeneously. This leads to lower emissions, especially after the catalytic body sees significant use. The catalyst by the combination of these two teachings could be produced in a manner very similar

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to that of Hervert mentioned in the previous 102/103 rejection, where air spaces would be disposed between the three catalytic layers, rather than being in direct contact with one another.

Lastly, these two references are from analogous art, as they both deal with honeycomb catalyst design.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew E. Hoban whose telephone number is (571) 270-3585. The examiner can normally be reached on Monday - Friday from 7:30 AM to 5 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vickie Kim can be reached on (571) 272-0579. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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/Vickie Kim/
Supervisory Patent Examiner, Art Unit 4116